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A NEW BAIT TRAP FOR NOCTUID MOTHS

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Previous to the present year noctuid moths were collected for breeding purposes and flight records, in various ways, entailing long hours spent in the field at night. The methods employed were variations of the old practice of "sugaring" and collecting from bloom. Fairly good results were obtained by systematic night collections, but it seemed desirable to devise a method whereby material might be secured in sufficient quantities without so much night work. During the past winter the trap under discussion was designed and constructed as an experiment towards simplifying moth collections and flight records.

The trap consists of a demountable, rectangular, screened cage about 18 inches by 19 inches by 18 inches high, with a sheet metal top projecting one and one-half inches. Running horizontally on each side are three openings, 16 inches by 8 millimetres, through which the moths pass to reach the bait. The bait box is a very important item; it is a metal container, 4 inches wide by 8 inches long by 1⅝ inches deep. The lids are of screen hinged on the outer sides and fail to meet in the center by one-quarter inch to form an aperture for the wick. Supports for the bait are L-shaped pieces of band iron slotted into the underside of the metal top. About one inch from the top holes are drilled in the supports through which passes an iron rod from which to hang the wick. The wick is made from two-ply, heavy outing flannel and is 7 inches wide by 12½ inches long, with a half inch hem at the top, when finished. A wire with a hook on each end is fitted into the hem with which to hang the wick on the cross-rod. The lower end of the wick passes through the opening between the lids into the bait liquid contained in the box. The bait reservoir is held in position by the supports: the upturned bottom ends slip through slots in the ends of the box.

The wick is first well soaked in water then thoroughly saturated with the following lure:—

New Orleans molasses	1	pint
Fermented apple juice	2	ounces..
Essence of pear	10	drops
Essence of lavender	10	drops
Essence of anise	2	drops

When the wicks become fully drenched with the liquid, six ounces of the lure is placed in each container and the wicks folded in, leaving the hem and wire projecting through the opening between the lids. The boxes with the bait and wicks are stored in a covered metal tray for several days before using, to hasten fermentation in the molasses.

The traps were hung from the lower limbs of trees in situations which had been "sugared" successfully in former years. The bait boxes were all kept stored in a metal box during the day to prevent evaporation. In the late afternoon the

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traps were baited and about two inches of green leaves placed in the bottom as a "hide" for the moths after they had finished feeding.

The check on captures was made in the early morning when the moths were quiescent. Nearly all of the specimens were found among the leaves, making their removal and identification very easy as they might be handled one at a time. Working them over by daylight also made identification quite certain and any moths about which there was any element of doubt were taken to the laboratory for further study.

The traps were run continuously from the end of May to the end of October. Very few noctuid moths were on the wing during the month of June and the early part of July, as observations showed at bait, lights and bloom; consequently the captures in the traps were correspondingly small during this period. However from late July on throughout the summer the records were numerous and continuous. Sixty-four species of noctuids were taken, the greatest number of species captured in any one trap during a night was twenty-two. One trap captured 461 moths, comprising 22 species, in a single night; this trap averaged 44 moths per night from June to October. The records of traps run in the same locality were quite comparable both as to species and individuals.

A NEW ARGYROPLOCE SPECIES (EUCOSMIDAE, LEPID.)*

BY J. McDUNNOUGH,
Ottawa, Ont.

Some time ago, through the kindness of Mr. Tams of the British Museum, I was enabled to have specimens compared with the types of *dealbana* Wlk. and *similisana* Wlk. and the genitalia of both types examined. The result is a confirmation of Heinrich's placement in his revision, *dealbana* falling to *glaciana* Moesch. and *similisana* to *bipartitana* Clem.

In identifying this latter species I am taking it for granted that Heinrich's unqualified reference—after a study of type and paratype material—of *caesialbana* Zell. to *bipartitana* Clem. (1926, Bull. 132, U. S. N. M., 181) is correct, and that the very excellent description and figure given by Zeller (1875, Verh. z. b. Ges. Wien. XXV, 285, Pl. VIII, f. 19) may be relied upon to determine *bipartitana*. I mention this on account of the fact that Heinrich's figure of the male genitalia (op. cit. fig. 435) does not agree in an important particular with my genitalic slides of *bipartitana* as determined above. In all the material of this species which I have examined a hairpencil arises from the *extreme outer margin* of the valva and *not* from the centre of the hollowed-out space formed by the valva and the raised extension of the sacculus, as depicted by Heinrich; in many cases the position of this hairpencil can be accurately determined by removing a few scales from the tip of the abdomen and in a long series of specimens ranging over the entire width of the Dominion of Canada I find practically no variation in this structure. In the female genitalia I have matched Heinrich's figure (*op. cit.* fig. 249) very exactly with some of my slides; it might be noted that there is considerable variation shown in the length of the lateral arms of the genital plate but the tendency seems towards a *reduction* of length, as compared with the figure, rather than an increase of same.

*Contribution from the Division of Systematic Entomology, Entomological Branch. Dept. of Agric., Ottawa.

For some time I have had set apart a small series of both sexes of a species which, while very close to *bipartitana,* seems distinct on genitalic characters, and for which, in the light of the above remarks, there appears to be no available name. This species occurs later in the season, in July and August, whereas *bipartitana* normally appears in June, and only in colder latitudes (Bradore Bay, Que.) or higher altitudes (Nordegg, Alta.) in late July.

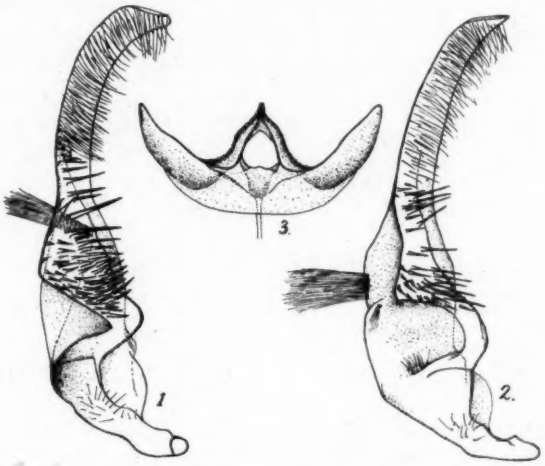


Fig. 1. Valve of male *A. trinitana* n. sp.; fig. 2. Valve of *A. bipartitana* Clem.; fig. 3. Female genital plate of *A. trinitana* n. sp.

The male genitalia differ from those of *bipartitana* very decidedly in the position of the above-mentioned hair-pencil; this does not arise from the edge of the valve, about opposite the angulation of the sacculus, but more apically from beneath the raised extension of the sacculus, its base being hidden and distinctly within the valval edge, (fig. 1). In the female the arms of the genital plate, (fig. 3), are greatly lengthened and there are further differences in the shape of the ostium. A reference to the figures will make this clear. I describe this species as follows.

Argyroploce trinitana n. sp.

Intermediate between *glaciana* and *bipartitana,* the depth of color in the banding of the forewings being more as in the former whilst the genitalic characters are close to those of the latter species.

Primaries rather shining white with deep olive-brown basal area and a broad median band of this same color. Outer edge of basal dark area oblique with a slight inward angle in the fold; antemedian pale band shining white, broad, with outer margin showing a slight projection below costa. Median band broad, evenly deep olive-brown with slight purplish scaling, including the pretornal triangular patch with which it is connected by brown and purplish scaling; outer margin of this band irregular, with slight indentation below cell above which is a minute shining dot, and with no traces of the round dark medianly situated spot which is often quite prominent in *bipartitana.* The three costal preapical spots much darker and more distinct than in *bipartitana,* the first spot

being largely included in the median band; apical round spot dark and distinct, connected by olive-brown shades with the narrow subapical patch, the whole forming a triangular dark patch on apical half of outer margin. A fine dark marginal line fading away towards tornus. Fringes dusky in apical half, cut narrowly by white below the apical spot. Secondaries pale, smoky, deeper in female with paler fringes. Hind tarsi unbanded. Expanse 14-16 mm.

Holotype—♂, Trenton, Ont., July 11, (Evans); No. 3282 in the Canadian National Collection, Ottawa.

Allotype—♀, Lyn, Ont., Aug. 10, (G. S. Walley).

Paratypes—5 ♂, Aweme, Man., July 2, 3, 20, 22, two marked as bred from *Cypripedium pubescens*; 1 ♂, Knowlton, Que., July 26, (L. J. Milne); 1 ♂, Knowlton, Que., Aug. 9, (J. McDunnough); 1 ♀, Ottawa, Ont., July 16, (C. Young); 1 ♀, Kearney, Ont., Aug. 4, (F. Ide); 1 ♀, Indian Head, Sask., July 22, (J. J. de Gryse).

NOTES ON UTAH DIPTERA[1]

BY GEORGE F. KNOWLTON,
Logan, Utah

The fauna of Utah is unusually rich in Diptera. Much remains to be done by way of recording the forms that occur in this area and in learning the distribution of the economic forms within the state. The following records are from recently classified material of the Utah Agricultural Experiment Station collection. The writer is indebted to Messrs. J.M. Aldrich, C.H. Curran, C.T. Greene, R.H. Painter, and J.S. Hine for naming most of the material listed below.

ORDER DIPTERA

Family *Chironomidae*

Diamesia waltlii Meig. Logan, March 18, 1923 (Knowlton).

Chironomus cristatus Fab. Numerous at Corinne, September 9, 1925 (Knowlton).

Chironomus utahensis Mall. Hyrum, 1928 (Knowlton); Logan, May 1, 1923 (Knowlton.)

Family *Culicidae*

Theobaldia impatiens Wlk. Bear River City, September 9, 1925 (Knowlton).

Aedes idahoensis Theob. Salt Lake City, September 5, 1923 (Knowlton).

Culex pipiens L. Salt Lake City, July 3, 1929 (Knowlton).

Culex tarsalis Coq. Corinne, September 1930 (Knowlton).

Culiseta incidens Thoms. Kelton, July 1929 (Knowlton).

Family *Mycetophilidae*

Sciara caldaria Lint. On beets at Richmond, July 12, 1929 (Knowlton); Uintah, September 14, 1925 (Knowlton).

[1]Contribution from the Department of Entomology, Utah Agricultural Experiment Station. Publication authorized by Director, October 30, 1930.

Family *Bibionidae*

Bibio albipennis Say. Willard, September 12, 1925 (Knowlton).

Bibio hirtus Loew. Beaver, May 17, 1927 (Knowlton); on beets, Ogden, June 9, 1927 (Knowlton).

Bibio nervosus Loew. Bountiful, May 8, 1929 (Knowlton); Logan, May 19, 1924 (Knowlton).

Bibio xanthopus Wied. Logan, May 17, 1923 (Knowlton).

Family *Stratiomyiidae*

Sargus viridis Say. On sugar-beets at Taylorsville, August 15, 1929 (Knowlton).

Stratiomyia lativentris Loew. Lehi, June 23, 1926 (Knowlton).

Odontomyia arcuata Loew. Brigham City, September 1, 10, and 12. 1925 (Knowlton); on *Chrysothamnus* blossom at Corinne, September 9, 1925 (Knowlton); Lewiston, September 9, 1925 (Knowlton); Lyman, June 27, 1926 (Knowlton).

Odontomyia nigrirostris Loew. Fairfield, May 24, 1929 (Knowlton).

Odontomyia inaequalis Loew. Corinne, August 21, 1929 (Knowlton and M.F. Bowen).

Odontomyia truquii Bell. On beets at Midvale, July 23, 1929 (Knowlton).

Odontomyia truquii innotata Curr. On beets at Lewiston, July 2, 1929 (Knowlton); Logan, August 20, 1923 (Knowlton).

Odontomyia tumida Banks. Bountiful, August 18, 1929 (Pack); Corinne, August 5, 1929 (Knowlton); Iosepa, August 27, 1929 (Knowlton and Bowen); Skull Valley, August 27, 1929 (Knowlton and Bowen).

Myxosargus nigricornis Gr. Collinston, September 8, 1925 (Knowlton).

Myxosargus knowltoni Curr. Davis County Experimental Farm, Farmington, June 23, 1927 (Knowlton).

Nemotelus canadensis Loew. Clearfield, July 12, 1927 (Knowlton); on beets at Lehi, July 23, 1927 (Knowlton); Lampo, August 22, 1929 (Knowlton) Timpie, August 16, 1929 (Knowlton).

Nemotelus unicolor Loew. On sugar-beets at American Fork, June 23, 1926 (Knowlton).

Family *Tabanidae*

Chrysops discalis Will. Brigham City, July 10, 1930 (Knowlton and Janes); Clearfield, July 12, 1927 (Knowlton); Corinne, June 27, July 21 and August 5, 1929 (Knowlton and Bowen); Farmington, July 10, 1930 (Knowlton and Janes); Locomotive Springs, August 1930 (Knowlton and Janes); Ogden, July 25, 1929 (Knowlton); Promontory, August 22, 1929 (Knowlton).

Chrysops fulvaster O.S. Appledale, July 30, 1929 (Knowlton); Corinne, July 13, 1929 (Knowlton and Bowen); Promontory, July 13, 1929 (Knowlton and Bowen).

Chrysops mitis O.S. Snowville, June 20, 1929 (Knowlton).

Chrysops moerens Wlk. Corinne, July 13, 1929 (Knowlton and Bowen).

Tabanus epistates O.S. Corinne, September 9, 1925 (Knowlton).

Tabanus lineola Fab. Fort Duchesne, June 26, 1926 (W. Sorenson), and July 8, 1927 (C.J. Sorenson); Logan, July 21, 1927 (Knowlton).

Tabanus gilanus Towns. Logan, July, 1929 (Pack); St. George, May 29, 1919.

Tabanus insuetus O.S. Corinne, June 22, 1929 (Knowlton and Bowen).

Tabanus intensivus Towns. Grantsville, June 14, 1929 (Knowlton).

Tabanus phaenops O.S. Corinne, June 22, 1929 (Knowlton); Kosmo, September 19, 1929 (Knowlton and Bowen); Logan, July 19, 1929 (Pack); Monument, August 1930 (Knowlton and Janes); Locomotive Springs, September 13, 1930 (Knowlton and Janes); Promontory, June 27, 1927 (Knowlton). This horse fly is frequently encountered in enormous numbers on the flats north of the Great Salt Lake; at times it becomes most annoying.

Tabanus productus Hine. Blue Creek, September 11, 1929 (Knowlton); Bothwell, September 30, 1929 (Knowlton); Farmington, July 17, 1930 (Knowlton and Janes); Lehi, June 23, 1926 (Knowlton); Magna, July 3, 1929 (Knowlton).

Tabanus pumilus Macq. American Fork, June 23, 1926 (Knowlton).

Tabanus punctifer O.S. The Delle, August 1929 (Knowlton); Skull Valley, August 1929 (Knowlton).

Silvius pollinosus Will. Fort Duchesne, June 2, 1926 (W. Sorenson).

Family *Bombyliidae*

Exoprosopa caliptera Say. Jamez Springs, New Mexico, June 13, 1914 (J. Westgate).

Exoprosopa divisa Coq. Corinne, July 13, 1929 (Knowlton); Kosmo, July 25, 1930 (Knowlton and Janes); Promontory, July 23, 1929 (Knowlton); Snowville, September 26, 1930 (Knowlton).

Exoprosopa rostrifera Jaenn. Jamez Springs, New Mexico, June 25, 1914 (Westgate).

Villa alternata Say. Bear River City, September 3, 1927 (Knowlton).

Villa catulina Coq. City Creek Canyon, 1925 (D.G. Hall); Tooele, June 14, 1929 (Knowlton).

Villa lateralis Say. Logan, June 30, 1929 (Pack); Logan Canyon, June 24, 1925 (Hall); Mt. Pleasant, September 10, 1929 (Pack); Ogden, September 7, 1929 (Knowlton); Promontory, July 30, 1929 (Knowlton).

Villa morio var. *seminigra* Loew. Bountiful, July 20, 1929 (Pack); Logan, July 1925 (Hall); Salt Lake City, June 23, 1926 (Knowlton).

Villa molitor Loew. Mt. Pleasant, September 15, 1929 (Pack); Ogden, September 7, 1929 (Knowlton).

Villa sinuosa Wied. Hurricane, July, 1926 (Knowlton); Logan, September 8, 1920 (Knowlton); Tony Grove, Logan Canyon, August, 1925 (Hall); Miners Peak, July 9, 1919. Also collected at Jamez Springs, New Mexico, June 1914 (Westgate).

Villa willistonii Coq. Amalga, August 18, 1927 (Knowlton); Mt. Pleasant, September 15, 1929 (Pack); Roy, September 2, 1927 (Knowlton); Trenton, August 22, 1927 (Knowlton).

Villa sp. Cedar Spring, August 3, 1929 (Knowlton); Corinne, July 13, 1929 (Knowlton); Promontory, July 27, 1929 (Knowlton).

Bombylius albicapillus Loew. Blacksmith Fork Canyon, May 12, 1927 (Knowlton); Cache Junction, June 3, 1919 (Hagan); Emigration Canyon, June 24, 1925 (6000 ft.) (Hall).

Bombylius lancifer O.S. City Creek Canyon, July, 1925 (Hall); Salt Lake City, September 6, 1927 (Knowlton). Also collected at Jamez Springs, New Mexico, May 19 and 23, 1914 (Westgate).

Bombylius major L. Logan, April 16, 1915 (L. Davidson); St. George, July 1925 (Hall).

Anastoechus barbatus O.S. Cache Junction, March 25, 1913 (Hagan).

Systoechus orcas O.S. Numerous at Blue Creek, July 11, 1929 (Knowlton); Dry Lake, July 5, 1923 and July 31, 1926 (Knowlton); Howell, September 26, 1930 (Knowlton); Hyrum, July 9, 1927 (Knowlton).

Lordotus apicula Coq. Vernon, May 24, 1929 (Knowlton).

Lordotus gibbus Loew. Amalga, August 3, 1927 (Knowlton); Logan, August 3, 1930 (Knowlton); Richmond, July 12, 1929 (Knowlton).

Phthiria sulphurea Loew. Snowville, August 30, 1929 (Knowlton).

Sparnopolius fulvus Wied. Miners Peak, Iron County, June 13, 1919.

Poecilanthrax halcyon Say. Amalga, August 31, 1927 (Knowlton).

Geron Sp. Paradise, August 19, 1925 (Knowlton).

Family *Therevidae*

Psilocephala aldrichii Coq. Bear River City, September 9, 1925 (Knowlton); Brigham City, August 24, 1927 (Knowlton); Corinne, June 24, 1924 (Knowlton); Lake Point, October 2, 1929 (Knowlton); Lehi, June 23, 1926 (Knowlton); on beets at Ogden, May 23, 1927 (Knowlton); Spanish Fork, July 26, 1927 (Knowlton).

Psilocephala costalis Loew. Corinne, June, 1929 (Knowlton); Lehi, July 23, 1927 (Knowlton); on beets at Provo, July 12, 1927 (Knowlton).

Psilocephala haemorrhoidalis Macq. On beets at Roy, June 30, 1927 (Knowlton).

Thereva hirticeps Loew. Dry Lake, July 31, 1926 (Knowlton).

Family *Dolichopodidae*

Mesorhaga townsendii Ald. On beets at Roy, June 30, 1929 (Knowlton).

Diaphorus sp. Brigham, September 12, 1925 (Knowlton); Richmond, May 9, 1925 (Knowlton); Smithfield, June 16, 1924 (Knowlton).

Chrysotus sp. Logan, July 20, 1927 and September 2, 1925 (Knowlton).

Medeterus veles V. D. Deseret, August 1929.

Scellus crinipes V.D. Garland, September 7, 1925 (Knowlton); on beets at Richfield, June 27, 1927 (Knowlton).

Scellus virago Ald. Cornish, August 18, 1926 (Knowlton).

Dolichopus consanguineus Wheel. Brigham, September 3, 1926 (Knowlton).

Dolichopus coquilletti Ald. Logan, May 2, 1923 (Knowlton); Salt Lake City, June 22, 1926 (Knowlton).

Dolichopus obcordatus Ald. Lehi, July 25, 1927 (Knowlton); Nephi, July 26, 1927 (Knowlton).

Pelastoneurus vagans Loew. Numerous at Brigham, September 12, 1925 (Knowlton); Willard, September 12, 1925 (Knowlton).

Family *Empididae*

Drapetis divergens Loew. Lewiston, July 2, 1927 (Knowlton).

Platypalpus discifer Loew. Ogden, June 9, 1927 (Knowlton).

Hemerodromia scapularis Loew. Brigham City, September 10, 1925 (Knowlton).

Family *Lonchopteridae*

Lonchoptera lutea Panz. On carrots, Smithfield, August 24, 1925 (Knowlton).

Family *Pipunculidae*

Pipunculus subvirescens Loew. This parasitic fly has been collected during the summer of 1930 at Amalga, Blue Creek, Bothwell, Collinston, Curlew Valley, Cedar Spring, College Ward, Draper, Delle, Fielding, Five Points, Grantsville, Garland, Hooper, Kelton, Kosmo, Lehi, Logan, Midvale, Promotory, Showell, Snowville, Skull Valley, Timpie, Wellsville, and West Weber (Knowlton, M.J. Janes and E. Nishimoto).

Family *Syrphidae*

Chrysogaster bellula Will. Amalga, August 21, 1927 (Knowlton); Kanesville, August 8, 1929 (Knowlton).

Paragus bicolor Fab. Dry Lake, July 5, 1929 (Knowlton and Bowen); Snowville, June 12, 1929 (Knowlton).

Pipiza radicum W. and R. Lampo, August 22, 1929 (Knowlton and Bowen).

Platychirus quadratus Say. Cornish, 1926 (Knowlton).

Melanostoma coerulescens Will. Miners Peak, July 11, 1919.

Eupeodes volucris O.S. Blue Creek, May 31, 1929 (Knowlton); Delle, August 6, 1929 (Knowlton); Snowville, June 20, 1929 (Knowlton).

Syrphus arcuatus Fall. Sevier, June 27, 1927 (Knowlton).

Syrphus wiedmanii John. Provo, June 27, 1930 (Knowlton).

Toxomerus geminatus Say. Trenton, August, 1925 (Knowlton).

Sphaerophoria cylindrica Say. Benson, August 10, 1925 (Knowlton).

Sphaerophoria robusta Curr. Bear River City, September 9, 1929 (Knowlton).

Sphaerophoria scripta L. Iosepa, August 27, 1929 (Knowlton and Bowen).

Sphaerophoria sulphuripes Thoms. Benson, August 10, 1925 (Knowlton).

Copestylum caudatum Curr. Delle.

Volucella bombylans subsp. *erecta* Walk. Logan Canyon, July 26, 1926 (Knowlton).

Eristalis anthorinus var. *montanus* Will. Logan, August 20, 1923 (Knowlton).

Eristalis brousi Will. Farmington, August 6, 1929 (Knowlton); Logan, July 1930 (Knowlton).

Eristalis latifrons Loew. Richfield, June 27, 1927 (Knowlton).

Eristalis tenax L. Far West, August 9, 1929 (Knowlton).

Helophilus latifrons Loew. Amalga, July 8, 1930 (Knowlton); Lewiston; June 5, 1929 (Knowlton).

Eumerus strigatus Fall. Bear River City, July 22, 1929 (Knowlton); Lewiston, August 24, 1925 (Knowlton); Wellsville, August 24, 1925 (Knowlton).

Eumerus tuberculatus Rond. Cornish, July 29, 1927 (Knowlton); Lewiston, August 24, 1925 (Knowlton).

Syritta pipiens L. Newton, August 2, 1929 (Knowlton).

Scaeva pyrastri L. Dry Lake, July 5, 1929 (Knowlton and Bowen).

Herynia communicata Curr. Logan, August 1925 (Hall).

Lejops stipatus Wd. Amalga.

Family *Conopidae*

Physocephala burgessi Will. Smelter, July 18, 1909 (Titus).

Family *Oestridae*

Gastrophilus intestinalis DeG. Logan, Ogden, Salt Lake City, 1929 (Pack).

Oestrus ovis L. Salt Lake City, 1929 (Pack).

THE GENUS ISONYCHIA (EPHEMEROPTERA)*

BY J. MCDUNNOUGH,

Ottawa, Ont.

Owing to their general similarity the species of this genus have been much confused and for some time we have been accumulating material in the hopes of being able to straighten out the nomenclature. With the exception of *intermedius* Eaton from Arizona, which is entirely unknown to me, I find I can now satisfactorily tie down the existing names and incorporate therefore in the present paper the result of my studies.

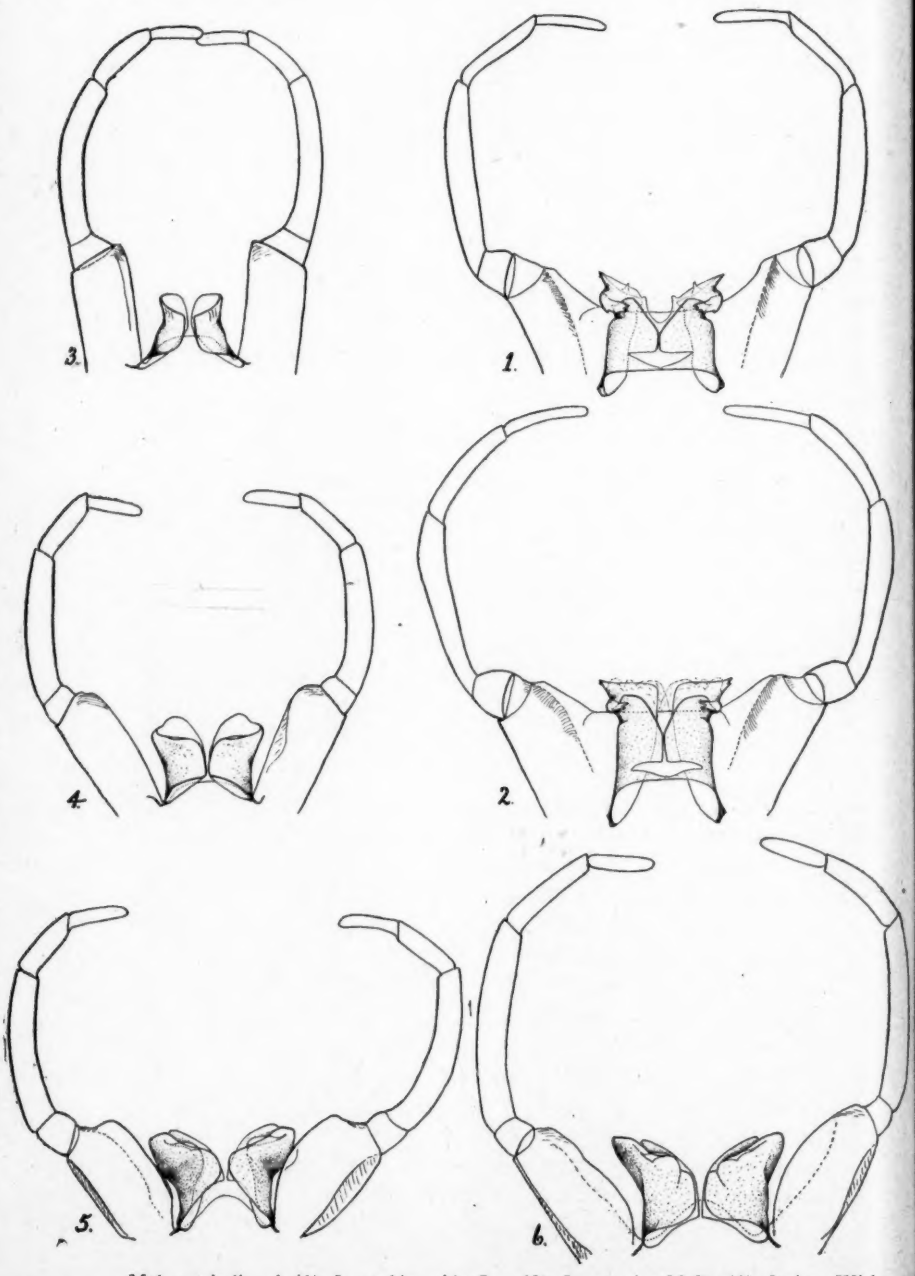
The main centre of distribution for the members of this genus seems to have been the mid-section of the Mississippi Valley region, no fewer than four species occuring in the vicinity of Davenport, Ia.; one of these, *arida* Say, is too rare for an attempt to be made to define its distributional area; a second, *sicca* Walsh, appears to have spread to the south and to the north-west, forming two more or less distinct races; a third, *bicolor* Walker (*albomanicatus* Needh.) extends in the opposite direction over eastern Canada and the United States whilst the fourth, *rufa* n. sp., is confined, as far as our present knowledge goes, to the eastern portion of the Great Plains area, between Kansas and Manitoba.

The species fall into two distinct groups according to the shape of the subgenital plate in the male and may be further separated by noting characters of wing-venation, abdominal color and male genitalia.

KEY TO MALES

1. Subgenital plate shallowly excavated at apex 2
   Subgenital plate deeply excavated, leaving lateral arms as long as the width of the plate 3
2. Crossveins of forewings colorless ..... *arida* Say
   Crossveins of forewings blackish ..... *georgiae* n. sp.
3. Crossveins of forewings colorless 4
   Crossveins brown-black or blackish 5
4. Abdomen deep piceous in color ..... *bicolor* Wlk.
   Abdomen bright reddish ..... *rufa* n. sp.
5. Crossveins of forewings heavy and black ..... *sicca* var. *manca* Eaton
   Crossveins of forewings thin and brownish 6
6. Thorax black-brown, abdomen shiny rufo-piceous ..... *sicca* Walsh
   Thorax ochreous brown, abdomen paler and duller brown ..... *sicca* var. *campestris* n. var.

*Contribution from the Division of Systematic Entomology, Entomological Branch. Dept. of Agric., Ottawa.



Male genitalia of (1) *Isonychia arida* Say (2) *I. georgiae* McD. (3) *I sicca* Wlsh. (4) *I. sicca* var. *manca* Eaton (5) *I. rufa* McD. (6) *I. bicolor* Wlk.

Isonychia arida Say

Baetis arida Say, 1839, Jour. Acad. Nat. Sci. Phil. VIII, 42; LeConte Edit. II, 412; Walsh, 1862, Proc. Acad. Nat. Sci. Phil. II, 370; *id.* 1863, Proc. Ent. Soc. Phil. II, 170.
Chirotonetes aridus Eaton, 1885, Rev. Mon. Rec. Eph. 206.

This species, evidently described from a female imago, was limited by Walsh and Eaton to a species in which the male subgenital plate has the posterior margin only shallowly excavated (*vide* Eaton, *op. cit.* Pl. XVIII, fig. 33e). In both sexes the veins and crossveins of the wings are pale and the male, at least, shows a series of dull yellowish subtriangular abdominal spots, based on the latero-anterior margin of each segment.

There is considerable doubt in my mind as to whether Walsh's limitation of this species was correct, but there seems nothing to be gained by altering his determination and changing the generally accepted idea of the species. As Eaton's figure of the finer details of the male genitalia is unrecognizable and evidently made from a dried specimen, I offer a fresh figure; the shape of the penes is reminiscent of certain *Heptagenia* species and it might be noted that the apical tubercle, indicated in my drawing by dotted lines, seems to be part of a very fine membrane which projects irregularly from the apex of the tubular penes and is not a definite chitinous spine.

The species is apparently rather rare and I have before me only a single pair, captured in Dane Co., Wisconsin by Professor W. S. Marshall.

Isonychia georgiae n. sp.

Fig. 2

Very similar to *arida* but most easily distinguished by the fact that the veins and crossveins of both wings are very decidedly blackish. The thorax is deep brown with some blackish shading anteriorly. The abdomen is deep ruddy brown, somewhat paler and brighter posteriorly, and the dorsum shows traces of black, broken, longitudinal, subdorsal and lateral lines, most distinct on the posterior segments. The forelegs are smoky and the two hind pairs of legs pale yellowish. The size is that of *arida*.

Holotype—♂, Rabun Co., Ga., July, 1910, (W. T. Davis); No. 3250 in the Canadian National Collection, Ottawa.

The type of genitalia is distinctly that of *arida* but the minor differences may be readily noted on reference to the figure.

Isonychia sicca Walsh

Fig. 3

Baetis sicca Walsh, 1862, Proc. Acad. Nat. Sci. Phil., 371; 1863, Proc. Ent. Soc. Phil., II, 170, *Chirotonetes siccus* Eaton, 1885, Rev. Mon., Rec. Eph., 208 (partim).

Sicca was stated to differ from *arida* in the *shorter* forelegs, *fuscous* wing venation and presence of dark intersegmental rings on at least the basal joints of the setae. Eaton amplified Walsh's description by giving a figure of the male genitalia but it seems probably that he confused two closely allied species and that his figure (Pl. XVIII, fig. 33d) should be referred to the species described later on by Needham as *albomanicata*.

From material collected by Mr. G. S. Walley at Davenport and Pleasant Valley, Iowa, (July 4, 5), localities situated directly across the Mississippi river from Rock Island, I have picked out a series of 3 ♂, 6 ♀ which agrees well with Walsh's characterization; I have further 1 ♂, 5 ♀ from Vincennes, Indiana (June 28) and 2 ♀ from Fulton, Ill. (July 20). Quite characteristic for

the species is the short foreleg in both sexes, the allied species mentioned above, and which occurs together with *sicca* at Pleasant Valley, having as long a foreleg as *arida* and also a pale wing venation. The veins of *sicca* are fine, especially the crossveins but, except for a few in the apical area of primaries, distinctly dark-tinged. It might further be noted that in the male the ventral surface of the abdomen is paler and ruddier than the dorsal one which is piceous, slightly paler and ruddier along the lateral flange, and generally with traces of longitudinal dark dashes in the spiracular area, most distinct on posterior segments. The two posterior pairs of legs are rather a clear light yellow with at times ruddy tinges, and the fore tarsi are smoky and with a distinct whitish area on the basal two-thirds of the first joint. The genitalia (fig. 3) are distinctive; the subgenical plate, in contradistinction to that of *arida,* being deeply emarginate and the penes short and rather truncate apically. In the female the crossveins of the forewing are slightly heavier and darker than in the male, notably in the apical area; the abdomen is ruddier but still shows traces of the dark lateral dashes, the legs are very similar in both color and length to those of the male and the dark or ruddy setal rings are slightly better defined. The head is light yellowish, variably shaded with light brown, a subtriangular ruddy (not black) patch is situated next each eye, adjacent to the posterior ocelli and in each posterolateral angle is a small blackish spot.

Isonychia sicca var. **manca** Eaton

Isonychia manca Eaton 1871, Trans. Ent. Soc. Lond. 134 (♀ *nec* ♂)
Chirotonetes manca Eaton 1885, Rev. Mon. Rec. Eph. 206.

The name was based on a female specimen from Texas, collected by Belfrage, probably in Bosque Co. I have matched the description very well with females from Lawrence, Kan., part of a series of both sexes collected in July and August by Mrs. L. W. Brown. On account of the similarity of the male genitalia I am inclined to consider *manca* as merely a race of *sicca,* inhabiting the southern portion of the Great Plains area.

As compared with *sicca* the males, heretofore undescribed, are characterized by a more decided ruddy tinge to the abdomen; the forelegs are much the same in color but slightly longer, due to a lengthening of the tarsal joints, the entire tarsus being generally fully equal in length to the tibia; the crossveins of the forewings are decidedly thicker and blacker in color and are generally rather more numerous, the apical region, however, as in *sicca,* showing pale crossveins. In the genitalia the penes are stouter and generally longer, extending more than halfway to the apex of the lateral arm of the subgenital plate, the apical area is also slightly differently shaped, as a reference to the figure will show; these differences however, do not seem to be entirely constant.

The female shows the same venational characteristics as the male, the crossveins, however, in the apical region being blackish. The head generally (but not constantly) has the double median brown stripe mentioned by Eaton; the dark triangular patch in the corner between the eye and the posterior ocellus is deeper in color than in *sicca,* being blackish and not ruddy; the posterior dark spot is very small and the width of the occiput is somewhat greater. The foretarsi, on the whole, are rather paler than those of *sicca.* The size is somewhat larger.

Isonychia sicca var. **campestris** n. var.

I propose the above name for the form common in southern Alberta. As compared with typical *sicca* the males differ in their generally paler color; the thorax is light brown (not the deep rufo-piceous of *sicca*) shaded somewhat with ruddy and black-brown on the posterior prolongation; the abdomen dorsally is rather dull brown, with a slight rufous tinge, shaded laterally with deeper brown, giving the appearance of poorly defined dark patches, below which the lateral edge appears quite pale brown; ventrally light brown, somewhat paler than the dorsum. Setae pale whitish-yellow, finely ringed with red-brown on basal segments. Foreleg entirely rufo-piceous, the tarsi somewhat paler; two hinder pairs of legs a rather dull yellow with slight rufous shading on the femora. Wings as in *sicca*.

The female is in general similar to the male; the head is pale yellowish with traces (in some absent, in others well-defined) of a geminate median brown stripe; the triangular patch in the angle between eye and ocellus is well-developed and black-brown in color but the black lateral spots on the occiput are wanting. The subanal plate is pale yellowish and shaped as in *sicca*.

Holotype—♂, Medicine Hat, Alta., Aug. 6, 1929, (J. H. Pepper); No. 3252 in the Canadian National Collection, Ottawa.

Allotype—♀, same locality, Aug. 9.

Paratypes—1 ♂, 1 ♀, same data as holotype and allotype; 4 ♂, 3 ♀, same locality, Aug. 22-24, 1930; 1 ♂, Lethbridge, Alta., Aug. 15, 1928, (J. McDunnough); 8 ♀, Lethbridge, Alta., Aug. 1, 4, 5, 13, 1929, (Pepper); 1 ♂, 3 ♀, Milk River, Alta., Aug. 23, 1929, (Pepper).

The male genitalia show no appreciable difference from those of *sicca*, the length of the penes varying considerably. The form extends eastward into Saskatchewan (Saskatoon, Aug. 18, 26) and Manitoba (Aweme, July 17, Aug. 25; Treesbank, July 18) and in this latter province can easily be confused with *rufa*, especially in the female sex; the darker venation in *campestris* is the most easily noted character, and the lack of the lateral black spot on the female occiput is also useful as a means of separation.

Isonychia bicolor Wlk.

Fig. 6

Palingenia bicolor Walker, 1853, List Neurop. Ins. Brit. Mus., III, 552.
Siphlurus bicolor Eaton, 1885, Rev. Mon. Rec. Eph., 221.
Chirotenetes albomanicatus Needham, 1905, Bull. 86, N. Y. Sta. Mus., 31.

This is the common species of the Eastern States and Ontario and Quebec. Walker's original description was based on a female subimago from St. Martin's Falls, Albany River, Ont. and the identification might be open to some doubt were it not for the fact that there is apparently only a single species occurring in eastern Canada. It is extremely common in July and August in the Ottawa and St. Lawrence valleys, extending southward into the United States through southwestern Quebec and the Niagara Peninsula, Needham's *albomanicatus* being based on Ithaca, N. Y. specimens. My material shows that it ranges southward down the Appalachians to Tennessee (Knoxville) and westward to northern Illinois (Kankakee, Oakwood) and Iowa (Davenport); it is quite probably that Walsh confused it with *sicca*, and Eaton's figure of the

genitalia under this name (Pl. XVIII, fig. 33d) would certainly seem to belong here.

In localities where the two species occur together *bicolor* is best separated in the male sex by the entirely pale wing-venation and the longer foreleg; the color of the abdomen is rufo-piceous (rufous in alcohol specimens) with the posterior margins of segments and the lateral edges marked with black, and the ventral surface is as deeply colored as the dorsal one. The genitalia show considerable differences; the penes are longer and more pointed apically and show on the inner side of the dorso-apical margin a chitinous flap; slides made from specimens from Illinois and Iowa show a slight difference in shape from those based on New York and Ontario material, the apices of the penes being less bent outward in the former specimens and the organ itself somewhat longer; I can find no differences in the adults and believe that these variations are of no specific value. In the female the crossveins are slightly tinted with brownish, especially in the apical area of the forewings. The head is often considerably suffused with brown, the angle between the eye and the posterior ocellus is filled in with ruddy brown and the black spots in the corners of the occiput are well-developed. The subanal plate is considerably broader and more rectangular than in *sicca* and the apices are bent down and under. The size is generally larger than that of typical *sicca* and close to that of *manca*.

Isonychia rufa n. sp.

Fig. 5

Male.—Eyes (living) ruddy chestnut; head light brown with the bases of ocelli black-ringed. Thorax ruddy brown. Abdomen dorsally bright reddish, paler and duller ventrally; no piceous shading except slightly along posterior margins of segments; forceps pale ruddy brown. Setae whitish-yellow, with traces of ruddy rings between the basal segments. Forelegs with coxae and femora deep ruddy, tibiae piceous and tarsi dull whitish-yellow with the apical portion of each joint shaded with smoky; the tarsus as long as the tibia and the whole leg slightly longer than in *sicca*. Mid and hindlegs rather a deep yellowish. Wings hyaline with pale venation. Length of body and forewing, 10 mm.

Female.—Very similar to the male in coloration. Head pale yellow with brown shading around the bases of the ocelli and in the angles between the eyes and the ocelli; a small lateral black spot on the occiput. Wings with at times a faint brownish tinge to the crossveins. Subanal plate as in *bicolor*.

Holotype—♂, Davenport, Ia., July 7, (G. S. Walley); No. 3251 in the Canadian National Collection, Ottawa.

Allotype—♀, Lawrence, Douglas Co., Kansas, May 5, (W. J. Brown).

Paratypes—1 ♂, Pleasant Valley, Ia., July 4, (Walley); 4 ♂, 3 ♀, Douglas Co., Kansas, June 12-16, (W. J. Brown); 8 ♂, Lawrence, Kansas, July-Aug., (Mrs. L. W. Brown).

The bright reddish color of the abdomen in dried specimens easily separates *rufa* from *sicca* and *bicolor;* the colorless venation separates it from *sicca* and allies it with *bicolor*, with which species it also shows considerable similarity in genitalia, the lateral arms, however, of the subgenital plate being shorter and chunkier. It would appear to replace *bicolor* in the Great Plains region

but in certain sections (Davenport, Ia.) occurs along with it, and for this reason I treat the species as a good one and not as a race of *bicolor*. Judging by the dates it would appear to have two generations at Lawrence, Kan. where it swarms to light along with *manca;* it ranges northward into Manitoba and I have a series of specimens before me from Treesbank, July 12, which are only slightly duller in color than my Kansas ones.

NOTES ON THE PITYOPHTHORINAE (COLEOPTERA IPIDAE) II THREE NEW SPECIES*

BY K. SCHEDL,
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Pityophthorus smithi n. sp.

Female. Dark brown in colour; 2.37 mm. long, 2.62 times as long as wide; allied to *varians* Schedl.

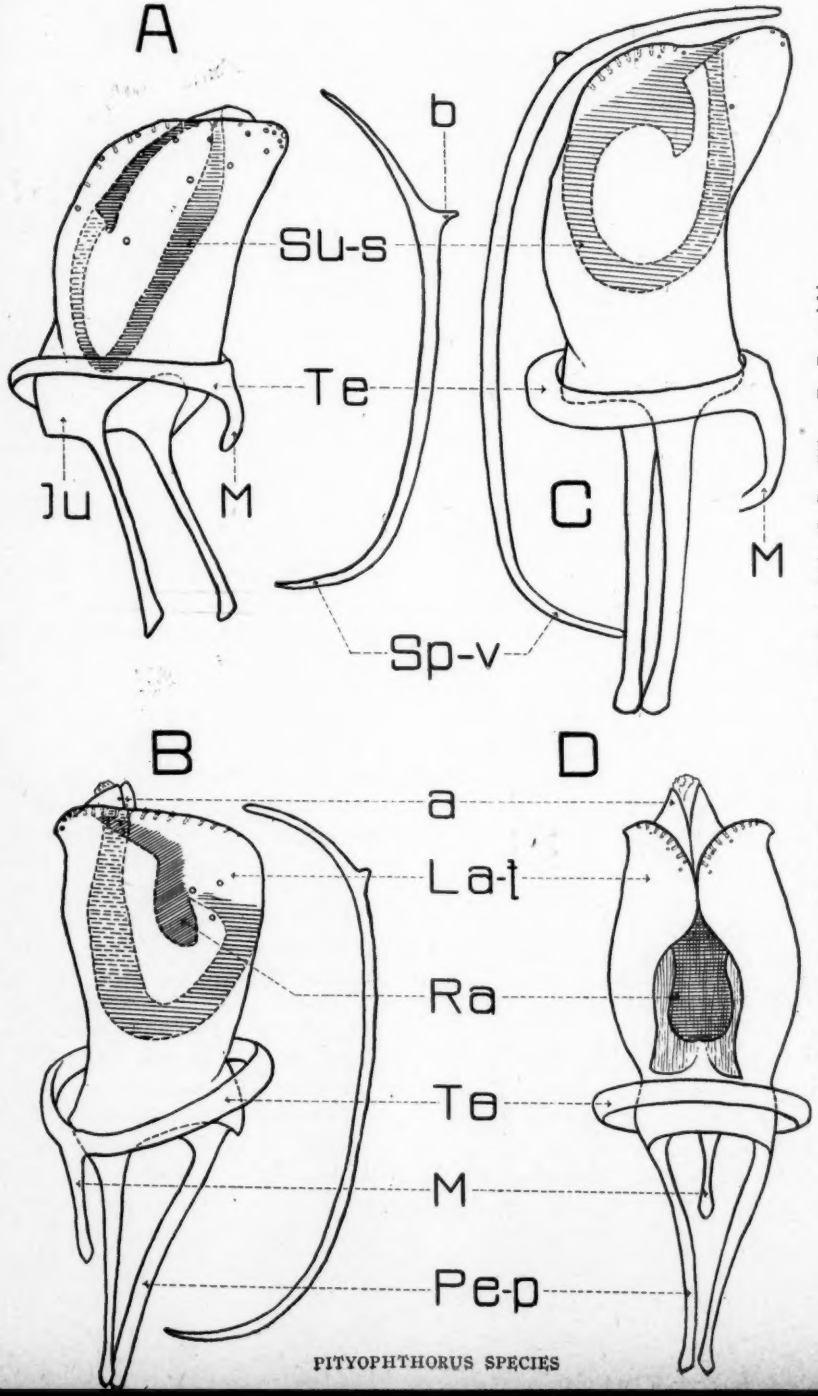
Front flattened on a semicircular area below, rather finely moderately closely punctured, interspaces finely rugose, with very fine, inconspicuous hairs and with a distinctly but not strongly developed longitudinal carina which extends up to a level of the middle of the eyes; antennae concolourous, club 1.65 times as long as the funicle, 1.33 times as long as wide, first suture straight, second feebly arcuate, third strongly arcuate; *eyes* moderately coarsely granulate, the inner line emarginate, emargination wider than deep.

Pronotum as wide as long, basal margin broadly arcuate, sinuate, posterolateral angles rounded, widest near the base, sides broadly arcuate on the posterior half, tapering cephalad (from base towards the middle), rather feebly constricted before the middle, moderately broadly rounded in front; anterior margin with numerous low serrations; anterior area with broad, low asperities in nearly regular concentric rows; summit moderately high with a feebly developed transverse impression posterior to it; posterior area coarsely, moderately densely punctured, interspaces finely reticulate; median line smooth extending from the base to the summit.

Elytra slightly wider than the pronotum, widest at the middle, 1.71 times as long as wide, sides subparallel, faintly arcuate, broadly rounded behind; surface shining, strial punctures moderately coarse, in fairly regular rows, first striae distinctly impressed, others not at all, first and second striae with punctures slightly irregular near the base; interspaces moderately wide, slightly rugulose near the base, punctures similar to those of the striae, sparse on the sides, little more numerous on the disc, surface appearing subglabrous but with very fine hairs arising from the strial punctures; *declivity* rounded, moderately deeply sulcate; suture rather strongly elevated with numerous setose granules; punctures of first striae obsolescent, those of the second striae strongly reduced but visible; second interspace (sulcus) smooth, shining, moderately wide; lateral convexities moderately high, with rather strongly developed setose granules, the granules of the sutures somewhat smaller in size, numerous.

The *male* is similar in size, proportions and sculpture; the frons is flattened between the eyes, rather coarsely punctured with a well developed, ele-

*Contribution from the Division of Forest Insects, Entomological Branch, Department of Agriculture, Ottawa, Canada.



Male Genitalia of *A. Pityophthorus lygmaeus*; *B. P. smithi*; *C. P. pilifer*; *D. P. smithi.*

PITYOPHTHORUS SPECIES

vated, laterally compressed, tooth-like longitudinal carina.

Holotype; ♀, Copper Mountain, B. C., (G. Stace Smith), from twigs of *Pinus contorta*, 29.x, 1929; No. 3168 in the Canadian National Collection, Ottawa.

Allotype; ♂, same date.

Paratypes; 3 ♀, and 2 ♂, same data.

Proventriculus. Proventricular plate 0.23 mm. long, 3.0 times as long as wide, 3.0 times as long as the anterior plate; masticatory brushes diverge at four-fifths of their length; anterior closing teeth slightly longer than the anterior plate, the first pair smooth on both sides, the others becoming more and more serrate on the externo-lateral margin, femoral teeth indicated, becoming connected with the lateral serrations; median elevation with two moderately long bristle-like teeth; anterior plate deeply, rather widely emarginate with 10 rows of low, blunt, scale-like teeth.

Penis 0.30 mm. long; the laminae dorsales and ventrales fused at the sides, very heavily chitinized, widest at the middle when viewed from above, near the caudal angle when seen from the side, ventrally narrowly separated, dorsally touching each other at the dorso-caudal angle, widely separated anteriorly, the connection brought about by membranes, three sensatory pores near the dorso-caudal angle, a sparse row on the caudal margin; *radii* very heavily chitinized, fused medially, rather short, blunt, caudad with prolongations which extend beyond the fused laminae; *sulcus seminalis* recurved, very slightly chitinized on the ventral half, more strongly on the dorsal half; *jugum* very heavily chitinized on the dorsal half only; *pediculi penis* 0.76 times as long as the whole penis, slender; parameren as usual, metula long, one-half the length of the pediculi penii; *spiculum ventrale* nearly as long as the whole penis, slender, caudal branch short.

Pityophthorus pygmaeus n. sp.

Adult. Reddish brown in colour, 1.15 mm. long, 2.68 times as long as wide; the smallest species of *Pityophthorus* seen by the author, allied to *P. opacus* Lec.

Front flattened on a semicircular area below, shining, rather coarsely, moderately densely punctured, with sparse, short, inconspicuous hairs and a fringe of longer hairs on the epistomal margin which are directed downwards; *antennal* club 1.53 times as long as the funicle, 1.17 times as long as wide, all the sutures moderately arcuate, first two sutures septate on the extreme lateral sides only; *eyes* moderately coarsely granulate, narrowly emarginate on the inner side.

Pronotum 1.05 times as long as wide, widest near the base; basal margin broadly rounded, sides subparallel on the basal two-fifths, then gradually tapering towards the front, the constriction before the middle hardly visible, moderately broadly rounded in front; anterior margin distinctly extended, armed with 6 very low, broad, small serrations; anterior area with low asperities, largely fused at their base, arranged in not regular concentric rows and very little extending to the sides; summit moderately high, transverse impression posterior to it distinct but rather feebly developed; posterior and lateral area rather coarsely, deeply, moderately closely punctured with short yellow hairs directed towards

the median line; the latter smooth narrow, scarcely elevated and extending from the base to the summit.

Elytra slightly wider than the pronotum, 1.70 times as long as wide; sides subparallel up to a level at the origin of the declivity, disc shining, broadly rounded behind; elytral striae in somewhat irregular rows, first striae distinctly impressed throughout, punctures moderate in size, not closely placed, rather shallow; interspaces moderately narrow, finely rugulose, punctures sparse on the disc, more numerous at the sides, and similar to those of the striae; *declivity* sloping, shining; suture moderately wide, slightly elevated, with very minute setose granules; first striae distinctly impressed, punctures greatly reduced; second interspaces moderately wide, flat, shining, finely reticulate; second striae with punctures greatly reduced; lateral convexities very low without granules but somewhat coarsely punctured; pubescence on the elytra short, erect, slightly longer at the sides and on the declivity.

No characters have been found which would indicate the sexes. From four examined antennae only one shows five distinct segments of the funicle; in the others the first two segments are fused in a way that the funicle appears 4-segmented. This species was set aside as new by Doctor J. M. Swaine with the manuscript name *pygmaeus* which name is here adopted.

Holotype; ♀, Ste. Anne, Que.; No. 3169 in the National Collection in Ottawa.

Paratypes; 4 the same data.

Proventriculus. The proventricular plate is 0.09 mm. long, 2.25 times as long as wide and 3 times as long as the anterior plate; the masticatory brushes are rather narrow, diverging at about four-fifths of their length; anterior closing teeth long, slender, extending far beyond the divergence of the brushes, smooth or with one single, small serration on the externo-lateral side and with three to four low, blunt femoral teeth on the instep; median elevation with two medium long, slender spines; anterior plate wider than long, rather narrowly emarginate, with six rows of blunt, low, scale-like teeth which are connected at their base in all rows except the two anterior ones, the first rows only reach the median line and are there connected with each other, other four rows decrease in length towards the anterior margin.

Penis. The penis is 0.21 mm. long; the laminae dorsales and ventrales are fused at the sides, moderately chitinized, tube-like, widest at the middle; the dorso-caudal angle of the fused laminae is evenly, broadly rounded, the dorsal and caudal margins enclose an angle of about 90 degrees; the *radii* are slender, not strongly developed, their caudal prolongations project slightly over the caudal margin of the fused lamina; the latter with several sensatory pores; *sulcus seminalis* distinct, recurved as in *P. watsoni* Schedl, strongly chitinized in the dorsal part, the ventral half semimembranous; parameren as usual, metula, moderately long, slightly curved; *jugum* distinct, connected with the body by a slightly chitinized membrane; *pediculi penis* 0.40 times as long as the whole penis, slender; *spiculum ventrale* as long as the body, caudal branch short.

Pityophthorus pilifer n. sp.

Female—Reddish brown in colour, 2.00 mm. long, 2.84 times as long as wide; somewhat allied to *P. setosus* Blackman, but representing a rather isolated

species of the fifth group according to the key from W. M. Blackman.

Front flattened on more than a semicircular area below but not quite extending from eye to eye, with closely placed fine punctures and covered with a dense brush of moderately long, erect yellow hairs which are not longer at the periphery; *antennae* yellow, club 1.23 times as long as the funicle, 1.20 times as long as wide, first two sutures nearly straight, third strongly arcuate; *eyes* moderately coarsely granulate, with a shallow emargination on the inner side.

Pronotum 1.19 times as long as wide, widest behind the middle; basal margin broadly sinuate; postero-lateral angles rounded; sides subparallel on the posterior half, slightly constricted before the middle, broadly rounded in front; anterior margin with numerous, low serrations, only little differing in size from the sides towards the middle; anterior area with low asperities, not fused at their base, in broken concentric rows, extending at the sides up to the middle of the pronotum; summit moderately high, transverse impression posterior to it rather strongly developed; posterior area with punctures rather small, not closely placed, interspaces smooth, shining; median line smooth, very narrow, not elevated.

Elytra distinctly wider than the pronotum, 1.69 times as long as wide, sides subparallel, feebly arcuate, rather narrowly rounded behind; punctures of elytral striae in fairly regular rows, moderately large, moderately closely placed, rather shallow, first striae distinctly impressed, others hardly; interspaces moderately narrow, minutely reticulate, interstrial punctures sparse, as large as those of the striae; *declivity* oblique, sutures moderately wide, rather strongly elevated, with numerous very fine, setose granules; punctures of first and second striae greatly reduced, but visible; sulcus wide, shining, rather deep; lateral convexities rather high, with large setose granules on the third interspace.

Male of similar size but much stouter (1.70) coarser in sculpture, elytral interspaces more strongly rugulose, on the disc, declivital sulcus only slightly deeper, granules of the same size as in the female; front of the head convex, coarsely but not closely punctured, with sparse, inconspicuous, short hairs, interspaces smooth, and with a rather feebly elevated longitudinal carina which extends from the epistomal margin up to a level of the upper margin of the eyes, smooth, shining.

In the type series there occur variations, in the female the hairs of the front sometimes becoming much sparser, the proportions of the body vary from 2.80 to nearly 3 times as long as wide and the declivity becomes in some specimens distinctly steeper.

Holotype; ♀, Frater, Ont., 8-vii-1925, *Picea canadensis*, (E. B. Watson); No. 3170 in the National Collection, Ottawa.

Allotype; ♂, same data.

Paratypes; 2 ♀, same data; 32 ♀, 10 ♂, Frater, Ont. 25-vii-1925, *Picea canadensis*, (H. S. Fleming).

Proventriculus. Proventricular plate 2.25 times as long as wide, nearly 4 times as long as the anterior plate; masticatory brushes diverge at three-fourths of their length; anterior closing teeth twice as long as the anterior plate, sharply serrate on the externo-lateral margin, without true femoral teeth but with

a little hump indicating them; median elevation with one pair of rather short, bristle-like teeth; anterior plate wider than long, moderately deeply emarginate, anterior-lateral angles broadly rounded, with six rows of low, blunt, closely placed, scale-like teeth.

Penis 0.29 mm. long; laminae dorsales and ventrales fused at the sides, heavily chitinized, forming a slightly curved equidistant tube when viewed from above, widest behind the middle when seen from above, sensatory pores sparse, ventro-caudal angle much more than 90 degrees, caudal margin oblique, ventrally narrowly separated, dorsally touching each other at the dorso-caudal angle, from there gradually becoming widely separated towards the base; *radii* moderately long, heavily chitinized, fused medially, without caudal prolongations; *sulcus seminalis* not extending as far anteriorly as the base of the lamina, heavily chitinized in the dorsal half more feebly on the ventral half; *jugum* distinct, heavily chitinized; *pediculi penis* slender, 0.45 times as long as the whole penis; parameren as usual, metula long, curved; *spiculum ventrale* slender, as long as the whole penis, caudal branch short.

NEW CANADIAN SPECIES OF ARENETRA (HYMEN.; ICHNEUMONIDAE)*

BY G. STUART WALLEY,
Ottawa, Ont.

The following new species of *Arenetra* have come to hand in working over some miscellaneous material in the Canadian National Collection. The genus *Arenetra* is referable to the tribe *Lissonotini* as defined by Cushman and Rohwer (Proc. U. S. N. M., 57, 392, 1920). The characters mentioned by Ashmead (Proc. U. S. N. M., 23, 50, 1900) will aid in separating species of *Arenetra* from related genera. Of importance among these are the non-areolated propodeum, sessile abdomen, distinct areolet, non-pectinate tarsal claws and long erect whitish or black pile on the head and thorax.

Arenetra caliginosa n. sp.

Male.—Length 9.5 mm. Head, thorax, base of legs and base of first abdominal tergite with long black pile. Head rather dull with very numerous, crowded, shallow, not sharply defined punctures. Mandibles black with blunt tip scarcely toothed, punctate and pilose except at apex. Malar space equalling width of mandible at base. Face with a small tumid area below antennae. Eyes moderately large, their upper margins extending to level of vertex. Facial quadrangle (i. e. area of face enclosed between compound eyes) two-thirds as long as broad. Antenna with pedicel short, broad, densely punctate and heavily pilose; flagellum 47 jointed, its basal joint slightly more than twice length of succeeding joint; all joints of flagellum clothed with very short fine pile, each bearing at the apex two or three longer stronger erect setae.

Pleura densely punctate; mesonotum more sparsely punctate, rather shining with faint indication of parapsidal furrows. Propodeum rugoso-punctate, without carinae; spiracles elongate-oval and distinctly elevated. Coxae, trochanters and posterior surface of all femora with long black pile; front basitarsi sub-equal in length to front tibiae; sub-apical joint of front tarsi four

*Contribution from the Division of Systematic Entomology, Entomological Branch. Dept. of Agric., Ottawa.

times as long as thick. Tegulae dirty yellow with a black spot at base. Wings with a smoky tinge. Front wings with areolet large with a short petiole; recurrent vein sinuous, received distinctly beyond middle of areolet; cubitodiscoidal vein angulate with ramellus well developed. Nervellus of hind wing angulate at its anterior one-fourth where longitudinal vein arises, thence running obliquely inward.

Spiracles of first abdominal segment located at basal third, prominent. First tergite dull with shallow indistinct confused punctures less dense apically; second tergite more polished with fewer punctures and none at apex; remaining tergites impunctate, shining, with apices very narrowly and indistinctly paler.

Color black, paler as follows: narrow apices of femora, front tibial spur, an indistinct line on posterior surface of hind tibia, narrow base and apex of hind tarsal joints obscurely ochraceous brown; apices of abdominal sternites narrowly yellowish brown.

Holotype— ♂, Dundurn, Saskatchewan April 23, 1923, (K. M. King); No. 3228 in the Canadian National Collection, Ottawa.

Arenetra hirsutula n. sp.

Male.—Length 11 mm. Head, thorax, base of legs and first abdominal segment with very long black pile. Head dull, punctate as in *caliginosa*. Mandibles black with two short teeth, punctate and pilose except at apex. Malar space distinctly broader than basal width of mandible. Face with a small tumid area below antennae. Eyes small, their upper margins below level of vertex. Facial quadrangle almost twice as broad as long. Antennae with pedicel short, broad, densely punctate and heavily pilose; flagellum 45 jointed, its basal joint two-fifths longer than succeeding joint; all joints of flagellum clothed only with very short fine pile.

Pleura densely punctate; mesonotum less heavily punctate, rather shining, without parapsidal furrows. Propodeum rugose with a weak longitudinal carina below the slightly elevated broadly ovate spiracle. Coxae, trochanters and posterior surface of all femora with very long black dense pile; front basi-tarsi scarcely two-thirds as long as front tibiae; sub-apical joint of front tarsus less than three times as long as thick. Tegulae uniformly black. Wings almost hyaline. Front wings with a small sessile areolet; recurrent vein almost straight, received a little before middle of areolet; cubitodiscoidal vein rounded, without ramellus. Nervellus of hind wing straight with a weak longitudinal vein arising at posterior three-fourths.

Spiracles of first abdominal segment located at basal third slightly elevated. First tergite dullish with indistinct confused punctures less dense apically, the apex at middle impunctate and polished; second tergite with fewer obscure punctures; second and third tergites with minute transverse rugulae; tergites beyond, impunctate, with apices scarcely paler.

Color black, paler as follows; extreme apices of front and middle femora; front and tibial spurs and front and mid tarsi; base and apex of hind tarsal joints (in some lights) obscurely ochreous brown; apices of abdominal sternites narrowly yellowish brown.

Holotype— ♂, Saskatoon, Saskatchewan, April 15, 1923, (K. M. King); No. 3229 in the Canadian National Collection, Ottawa.

Notes—This species resembles *caliginosa,* the best characters for distinguishing the two apparently being found in the position of the longitudinal vein where it joins the nervellus in the hindwing, the front tibia basi-tarsal ratio, and the vestiture of the antennae. The larger size and denser thoracic and cephalic pile of *hirsutula* are also noteworthy.

Arenetra canadensis Cress.

Arenetra canadensis Cresson, Can. Ent. I, 36, 1869.

Dr. E. T. Cresson Jr. has kindly examined the type of *canadensis* which is a male from London, Ontario, No. 1469 in the American Entomological Society Collection. I am thus able to offer additional notes on this species. *Canadensis* agrees with the above two species in its general black color, black femora, and black cephalic and thoracic pubescence. In *canadensis* the front and middle tibiae are ferruginous with apices paler; the antennae are uniformly pubescent without setae, the propodeum bears a slightly arched minute carina running transversely at the posterior three-fourths, also another running longitudinally below the spiracles; the tegulae are black; the nervellus of the hind wing is broken behind the middle by the longitudinal vein, while in the front wing the recurrent vein joins the areolet at middle (left wing) or slightly before (right wing). The length of the hair on the head and thorax is slightly shorter than the greatest diameter of the front femur in *canadensis;* in both *hirsutula* and *caliginosa* it is noticeably longer than their respective femoral diameters.

Arenetra occulta n. sp.

Male.—Length 10 mm. Head, thorax, base of legs and base of first abdominal tergite with rather long whitish pile. Head rather dull with numerous crowded, shallow poorly defined punctures. Mandibles long, rather narrow with two sharp teeth; feebly punctate and pilose except at apex. Malar space distinctly broader than basal width of mandible. Eyes moderately large, their upper margins extending to level of vertex. Facial quadrangle slightly more than two-thirds as long as broad. Antennae with pedicel short, broad, with numerous poorly defined punctures, pilose; flagellum 42 jointed, its basal joint two-fifths longer than succeeding joint; all joints of flagellum clothed only with very short pile.

Pleura with numerous rather shallow punctures, not crowded as in *hirsutula;* mesonotum similarly punctate, rather shining; parapsidal furrows only vaguely indicated. Propodeum for the most part confluently punctate; a longitudinal carina below the scarcely elevated almost circular spiracle; a stronger transverse carina at apical three-fourths beyond which the surface is longitudinally rugose. Coxae, trochanters, and femora behind, with long whitish pile; front tibia almost twice as long as basi-tarsi; sub-apical joint of front tarsus less than twice as long as thick. Tegulae black, obscurely edged with brownish stramineous. Wings with a smoky tinge. Front wings with areolet small without distinct petiole; recurrent vein almost straight, received slightly before middle of areolet; cubitodiscoidal vein rounded, without ramellus. Nervellus of hind wing slightly angulate at posterior two-thirds where the longitudinal vein arises.

Spiracles of first abdominal segment not prominent, located a little beyond basal third. First tergite basally at sides with shallow punctures, in middle rather smooth and impunctate becoming broadly longitudinally rugulose toward apex except for polished mid apical portion; following tergites impunc-

tate, rather shining. Narrow lateral margins of second and third and extreme apical margins of all but first tergite, yellowish white.

General color black, paler as follows: extreme apices of all femora, entire front and middle tibiae and tarsi brownish; hind tibia and tarsi blackish tinged with brown especially on lower surface of segments. Base and apex broadly of first two abdominal sternites and narrow apex of remainder dirty yellowish.

Holotype—♂, Victoria, British Columbia, March 4, 1921, (R. G.), No. 3230 in the Canadian National Collection, Ottawa.

Notes—In common with *nigrita* Cress., *ventralis* Cress., *leucotaenia* Vier. and the following one, this species has the hind femora black and the cephalic and thoracic pile whitish.

Arenetra vernalis n. sp.

Female.—Length 9 mm. Closely resembles *occulta* but with the following differences: transverse carina of propodeum less distinct with the surface beyond as in front, not longitudinally rugose. Wings slightly darker, the areolet with a distinct petiole with the recurrent vein received distinctly before the middle; the cubitodiscoidal vein angulate, with a short ramellus. First abdominal tergite dullish with few punctures and not distinctly longitudinally rugulose. Two basal abdominal sternites dark brown with only apices yellowish. The sheath of the ovipositor is at least one-third longer than the first two abdominal segments.

Holotype—♀, Saskatoon, Saskatchewan, May 2, 1924, (K. M. King); No. 3231 in the Canadian National Collection, Ottawa.

Paratypes—♀, Saskatoon, Sask., Apr. 27, 1923, (King); ♀, Sudbury, Ont.; ♀, Queens Park, Aylmer, Que., Apr. 29, 1924, (Viereck) on the shrub *Lepargyraea canadensis* (L.) Greene.

APHID GALLS AS A NOCTUID FEEDING GROUND

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For the past several years live moths have been collected at the Entomological Laboratory, Lethbridge, Alta. for the purpose of securing eggs. Both light trap and bait have been used to make these collections.

On the night of August 28, 1929, a group of trees consisting chiefly of native cottonwoods, *Populus deltoides* Marsh., were painted with a solution of fermented honey and diluted molasses. The night was ideal for a moth flight with the temperature about 75 degrees F. and the humidity about 55 per cent. There was no moon and the breeze was very light. The moths should have been abundant but the frequent examination of the baited trees by means of a flashlight resulted in very few collections. An accidental flash into one of the baited trees, however, showed moths swarming among the branches. Hundreds of moths were resting on twigs and leaves and closer examination showed that practically every leaf contained a gall of *Pemphigus populitransversus* Rly. This aphis was very plentiful and practically all the trees contained galls. The moths were found to be feeding at the gall openings.

The next day a gall was removed from the tree and a female specimen of *Ipimorpha subvexa* Grt. was placed on it. The moth immediately unfolded her proboscis and began to feed at the gall opening.

On the night of August 29, the trees were again examined and moths were collected from the upper branches instead of from bait.

The following noctuid moths were collected during the two nights of observation.

Abagrotis placida Grt.; *Agrotis venerabilis* Wlk.; *Amphipyra glabella* Morr.; *Athetis extima* Wlk.; *Catocala orion* McD.; *Euxoa albipennis* Grt.; *Euxoa basalis* Grt.; *Euxoa campestris* Grt.; *Euxoa flavicollis* Sm.; *Euxoa ochrogaster* Gn. *Euxoa ridingsiana* Grt.; *Feltia ducens* Wlk.; *Graphiphora collaris* G. & R.; *Graphiphora smithii* Snell.; *Ipimorpha subvexa* Grt.; *Sidemia devastator* Brace.

Of the moths collected *Euxoa ochrogaster* Gn. was the most plentiful. The records of the light trap for this period show that *E. ochrogaster* Gn. was the predominating species coming to light.

The fact that noctuid moths are apparently readily attracted to trees containing aphid galls may explain in some measure why gardens planted in adequate shelter belts are usually more heavily infested with cutworms than those out in the open. From the number of moths found in these particular trees it is reasonable to expect that they would be capable of infesting a fair sized garden patch with sufficient eggs to cause a severe damage. *Pemphigus populitransversus* Rly. is very common on the native cottonwoods and any shelter belt containing these galls would become a potential attractant for noctuid moths. With excellent oviposition conditions presented by the garden cultivation and a sufficient food supply close by in the shelter belt it would seem that these two important factors governing cutworm concentration were ideally provided on the irrigated farms.

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